APPENDIX A

Statement of Work
for
Determination of Physiochemical Properties of Fuel and Oil Samples

08/03/06

I. Background

The Department of Energy (DOE) conducts research into fuels and lubricants for current and future technology engines and vehicles through the Fuels Technologies Program. The major goal of the Fuels Technology Program is to understand how the properties and chemistry of fuels and lubricants impact the efficiency, emissions and performance.

The National Renewable Energy Laboratory (NREL) implements and performs various projects under the Fuels Technology Program. The complete picture for advanced fuels and lubricants includes many pieces, including understanding of physical and chemical properties. NREL seeks a subcontract laboratory to assist in the evaluation of these advanced fuels and lubricants.

II. Objective

The objective of this project is to determine the physiochemical properties of fuels and lubricants, such as diesel fuel, biodiesel, gasoline, ethanol, and heavy duty lubrication oil, for advanced engines using ASTM standard test methods and other methods, as appropriate.

III. Scope of Work

Task 1. Coordination of Sample Collection and Shipping

A work order will be initiated by NREL for each sample or set of samples to be tested on an as-needed basis. A sample of this work order is attached (see Attachment 1). The work order will include a unique sequential number assigned by NREL, sample description, test(s) to be performed and test method(s). The work order will include a not-to-exceed cost ceiling and a standard turn around time of 10 working days.

Upon receipt of the work order, the Subcontractor shall work with NREL or an NREL designee to arrange for sample shipment. The samples will be shipped to the Subcontractor following all applicable sample packaging and shipping methods. NREL or its designee will ensure that a Materials Safety Data Sheet (MSDS) is included with each sample. The samples will be packaged in materials appropriate for the contents and be labeled with the following items: date, sample

ID, NREL point of contact including phone number, subcontract number, and work order number.

Task 2. Fuel or Lubricant Sample Testing

The Subcontractor shall perform ASTM tests or equivalent, as specified in the work order, to obtain physicochemical properties of fuels and lubricants samples. This task shall include storage of samples in advance of the testing, sample preparation as outlined in the applicable test, sample testing, storage of a retain sample for 6 months, and disposal. The subcontractor shall be willing and able to perform modifications to standard test methods under direction from NREL. These modifications include, but are not limited to, changing test duration or temperature, use of unique solvents, etc.

The Subcontractor shall be able to perform all applicable ASTM tests, or equivalent, on fuels and lubricants, including but not limited to:

Property	**Method(s)***
Standard Specification for Diesel Fuel Oils	D975
Biodiesel Specification	D6571
Benzene, Toluene, C_9 Aromatics	D3606, D5980, D5769
Oxygenates	D4815, D5599, D5845, EPA OFID Method
Vapor Pressure	D4953, D5190, and D5191
Olefin Content	D6550
Standard Specification for Automotie Spark-Ignition Engine Fuel	D4814
Standard Specification for Fuel Ethanol (Ed75-Ed85) for Automotive Spark-Ignition Engines	D5798
Flash Point	D93
Cloud Point	D2500
Water & Sediment	D1796 and D2709
Carbon Residue	D524
Ash	D482
Distillation	D86 and D2887
Viscosity	D445
Sulfur	D5453, D2622, D4294
Copper Strip Corrosion	D130
Cetane Number	D613 and D6890
Cetane Index	D4737 and D976
FIA Aromatics	D1319
SFC Aromatics	D5186
Density	D4052 and D1298
API Gravity	D287

Pour Point	D97
Gum	D381
Carbon/Hydrogen/Oxygen	D5291
Heat of Combustion, Net and Gross	D240
Low Temperature Flow Test	D4539
Cold Filter Plugging Point	D6371
Lubricity	D6078 and D6079
High Temperature Stability	D6468
Water Separability	D1401
Acid Number	D664
Peroxide Number	D3703
Total Base Number (TBN)	D4739 and D2896
Total Acid Number (TAN)	D664
Additive Metals (Ca, Mg, Zn, P)	D5185
Wear Metals (Fe, Pb, Cu, Cr)	D5185
Contaminant Metals (Si, Na, K)	D5185
Soot in Oil	IR or TGA
Rancimat	EN14112
Oxidation stability of distillate fuels (accelerated method)	D2274
Oxidation stability of gasoline (induction period method)	D525
Distillate fuel storage stability at 43°C	D4625
Liqui-Cut Micro-organism	
IR content in biodiesel	EN14078
* ASTM Test Method, unless otherwise noted	

Task 3. Data Submissions and Letter Report

The Subcontractor shall report results for each work order separately in a letter report. All data shall be reported using ASTM standard reporting conventions, including units of measure. All quality assurance records shall be maintained by the Subcontractor and be made available on request.

Task 4. Quality Assurance

The Subcontractor shall perform necessary calibrations and equipment verifications for all equipment utilized in this subcontract using a documented quality assurance program. All quality assurance records shall be made available on request.

Task 5. Fuel Quality Surveys

The Subcontractor shall collect fuel and/or lubricant samples from companies determined through a selection criteria. As part of the sample collection, the Subcontractor shall conduct telephone surveys, either technical or non-technical

as determined by NREL, to better understand fuel receipt, distribution, handling, and sampling processes at the specified companies. The Subcontractor shall perform analyses of the samples as directed by NREL, per the tasks above.

Task 6. Fuel Storage

The Subcontractor shall store drum quantities of fuels indoors under temperature controlled conditions, as necessary in support of Tasks 1, 2, and 5.

Task 7. Fuel Blending

The Subcontractor shall perform fuel blending for analysis under task 2 or storage followed by analysis, task 6 followed by task 2. The fuel blending shall be conducted per NREL instructions and follow appropriate techniques.

Task 8. Environmental Health and Safety

The Subcontractor shall comply with all local, state, and federal environmental health and safety regulations.

IV. Deliverables

The Subcontractor shall submit an electronic letter report, as described in Task 3, by the due date agreed upon in the work order. Microsoft Word and Excel are the preferred formats for the letter reports. A copy will be submitted to the NREL Technical Monitor and to NREL Contracts and Business Services, as listed below.

All deliverables shall be submitted to the following addresses:

TBD
Technical Monitor
National Renewable Energy Laboratory
1617 Cole Blvd, MS 1633
Golden, CO 80401-3393
E-mail: TBD

TBD
Subcontract Associate
National Renewable Energy Laboratory
1617 Cole Blvd, MS 1632
Golden, CO 80401-3393
E-mail: TBD

Attachment 1

Sample Work Order

NREL WORK ORDER #: XXX	
SUBCONTRACT #: XXX-X-XXXXX-XX	**SUBCONTRACTOR:**
PROJECT: Determination of Physiochemical Properties of Fuel & Oil Samples	
PROJECT LEAD: **Phone:** **Email:**	**TECHNICAL MONITOR:** TBD **Phone:** XXXXXXX **Email:**
DESCRIPTION OF WORK	
Please perform the following fuels tests on the diesel fuel Code Name: XXX	
DELIVERABLE	**DUE DATE**
Standard report summarizing results from testing requested above.	Standard due date is XXX working days from receipt of sample(s).
PERFORMANCE PERIOD AND CEILING AMOUNT	
▪ Standard due date. ▪ The ceiling amount for this work is $XXX	
REQUESTOR:	**DATE:**
AUTHORIZED BY:	**DATE:**